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Site-specific management in viticulture across space and time: from plant-environment interactions to the end product

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The identification and classification of agricultural sites with uniform characteristics from a physical point of view, also called zones, or in strict viticulture terms basic terroir units (BTUs), has crucial importance in precision and sustainable agriculture, with positive economic implications. Due to both a greater need to better understand regional-to-site variations in crop production and the growth in spatial analytic technologies, the study of sites or BTU has shifted from a largely descriptive regional science to a more applied, technical research field. The explosion of spatial data availability and sensing technologies has made the within-field scale of study more valuable to the individual grower. The result has been a greater adoption of these technologies, but also issues associated with both the spatial and temporal scales required for practical applications, as well as the relevant approaches for data synthesis. Agricultural zoning procedures applied at different spatial scales (from regional to farm or field scale) enable to support and optimize site-specific planning and management of vineyard agroecosystems. A site-specific management is expected to improve efficiency, while the optimization of agricultural decisions according to the site characteristics is likely to reveal the peculiarities of the product that depend on these characteristics. This management is dynamic, as changing is the environment and the market. There is a need for new multidisciplinary approaches in terroir analysis and zoning, to study soil, plant and climate systems in relation to the characteristics of agricultural products, to explore their resilience to climate change by means of quantitative dynamic and spatial modeling approaches. This work wants to group the results of previous papers of the authors relating to site-specific approach of viticultural terroir zoning.